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Ripley

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(54) **SNOWMOBILE**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 776 days.

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Related U.S. Application Data

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(51) **Int. Cl.**

B62M 27/00	(2006.01)
B62J 25/00	(2006.01)
B62M 27/02	(2006.01)

(52) **U.S. Cl.**

CPC ***B62J 25/00*** (2013.01); ***B62M 27/02*** (2013.01); *Y10T 403/70* (2015.01)

(58) **Field of Classification Search**

CPC B62M 27/00; B62M 27/02; B62M 2027/028; B62M 29/00

USPC 180/182, 190, 186; 280/781, 785, 281.1

See application file for complete search history.

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Primary Examiner — Anne Marie Boehler

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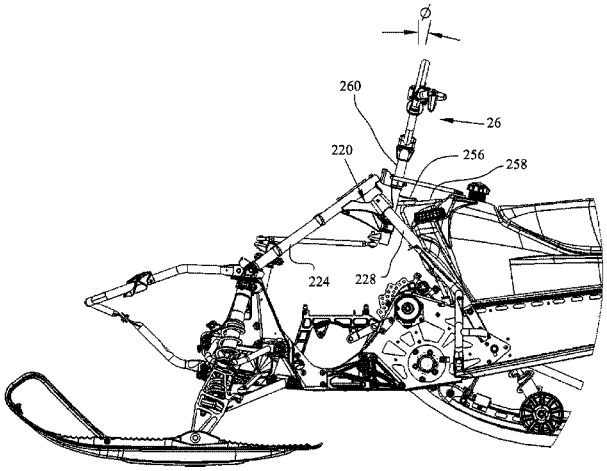
(57) **ABSTRACT**

The present invention generally relates to snowmobiles. More particularly, the present invention relates to the components of a snowmobile such as the frame, running boards and various other assemblies.

12 Claims, 22 Drawing Sheets



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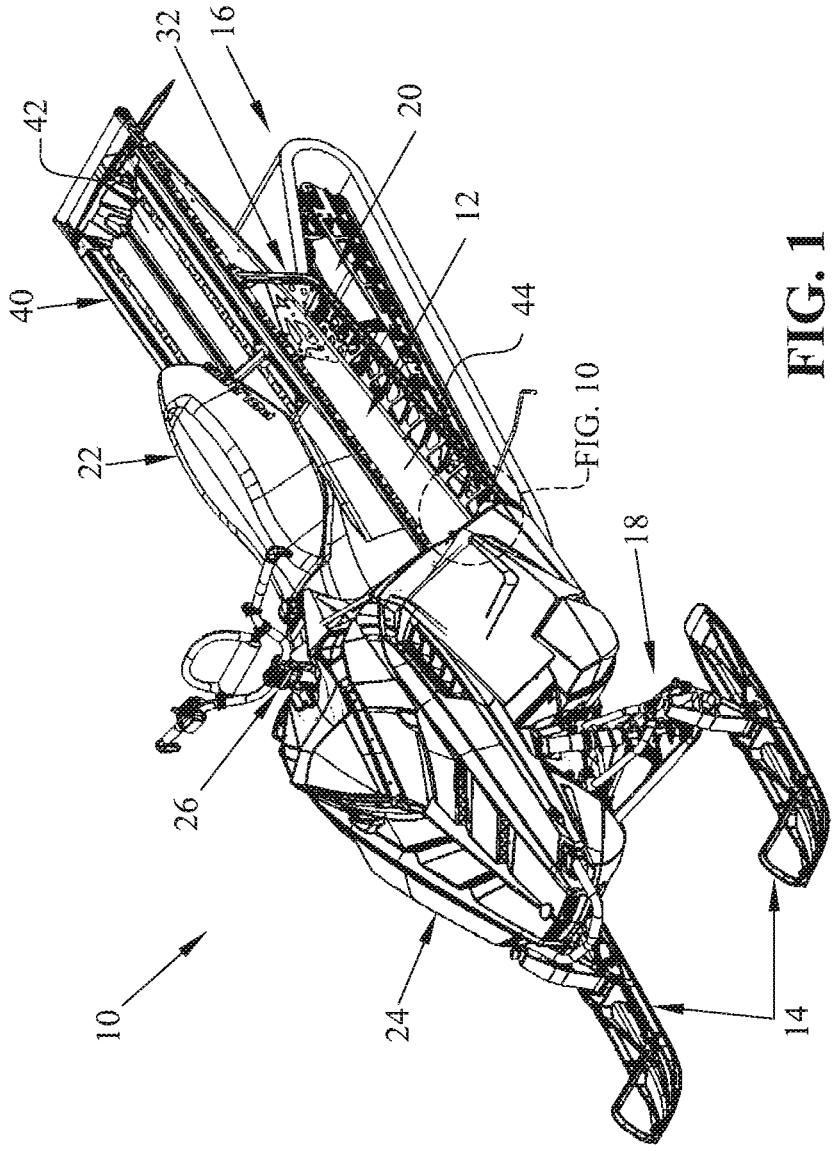

FIG. 1

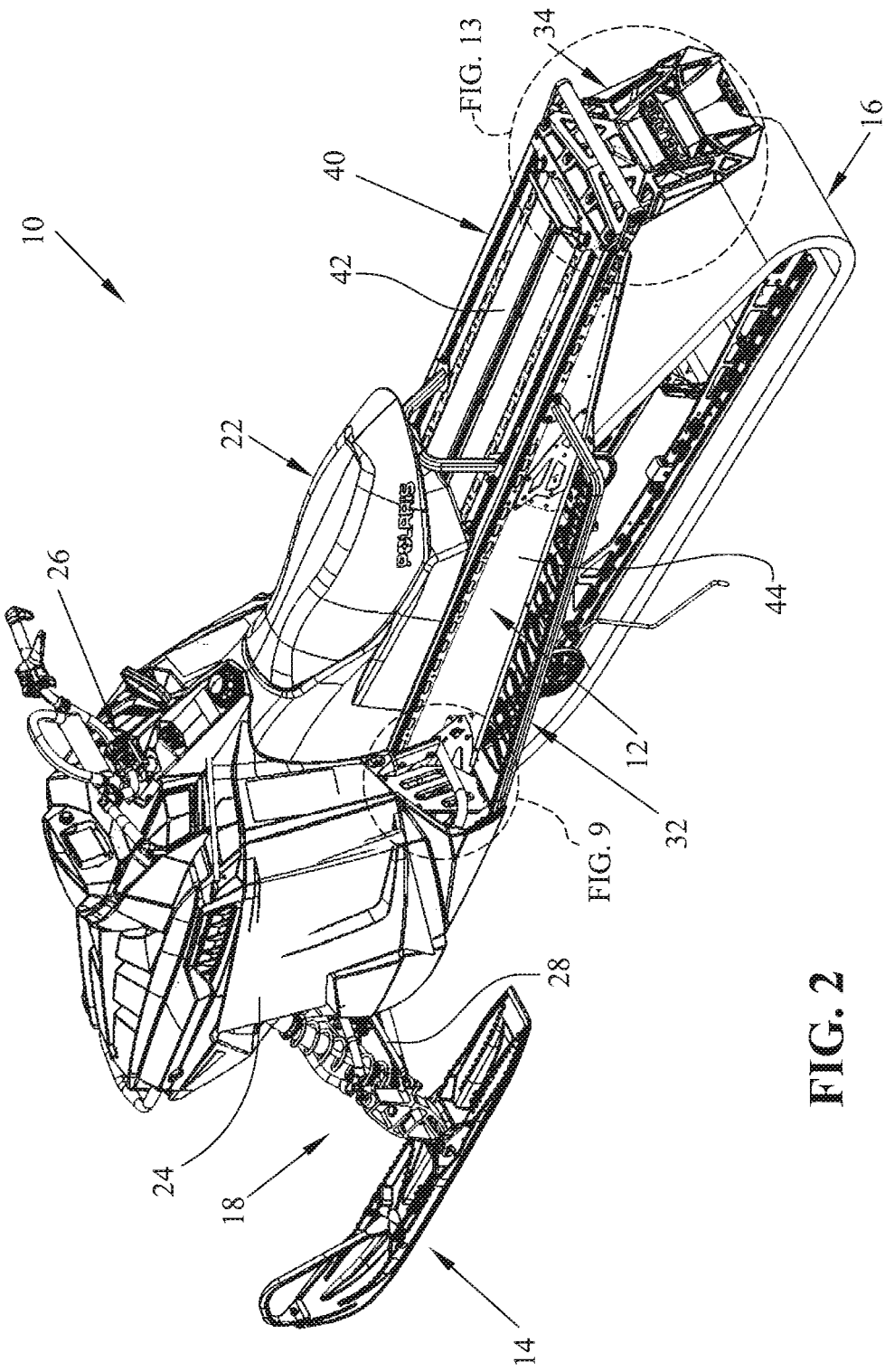

FIG. 2

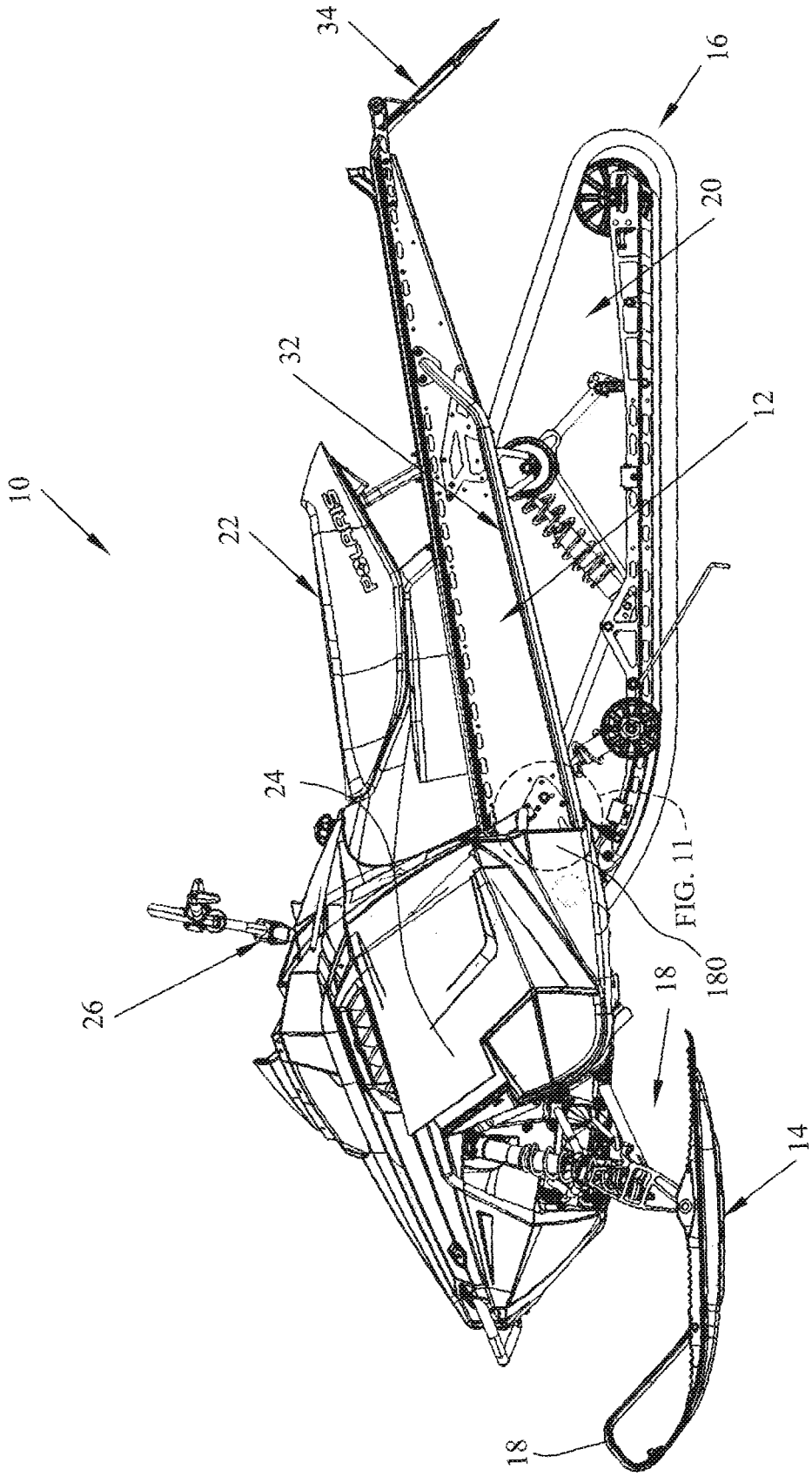

FIG. 3

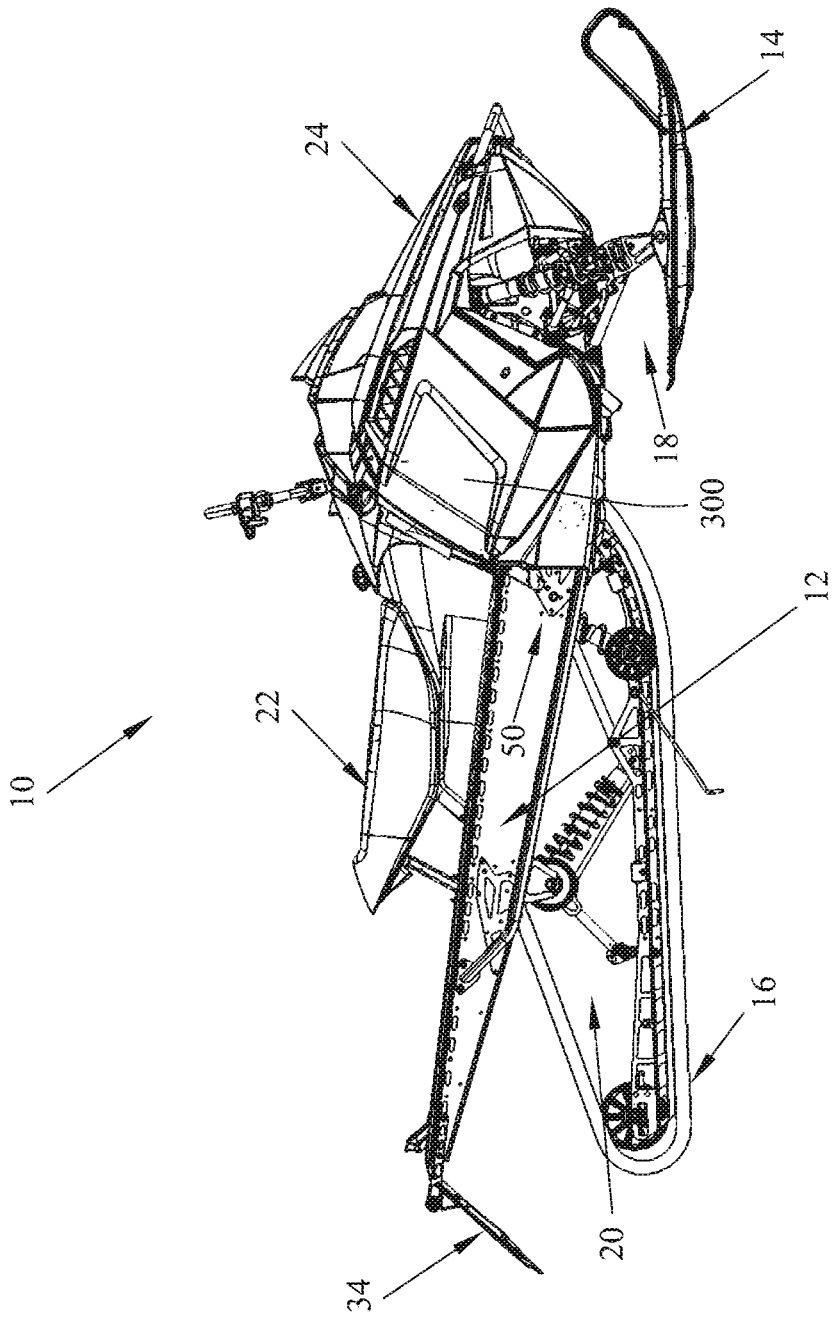

FIG. 4

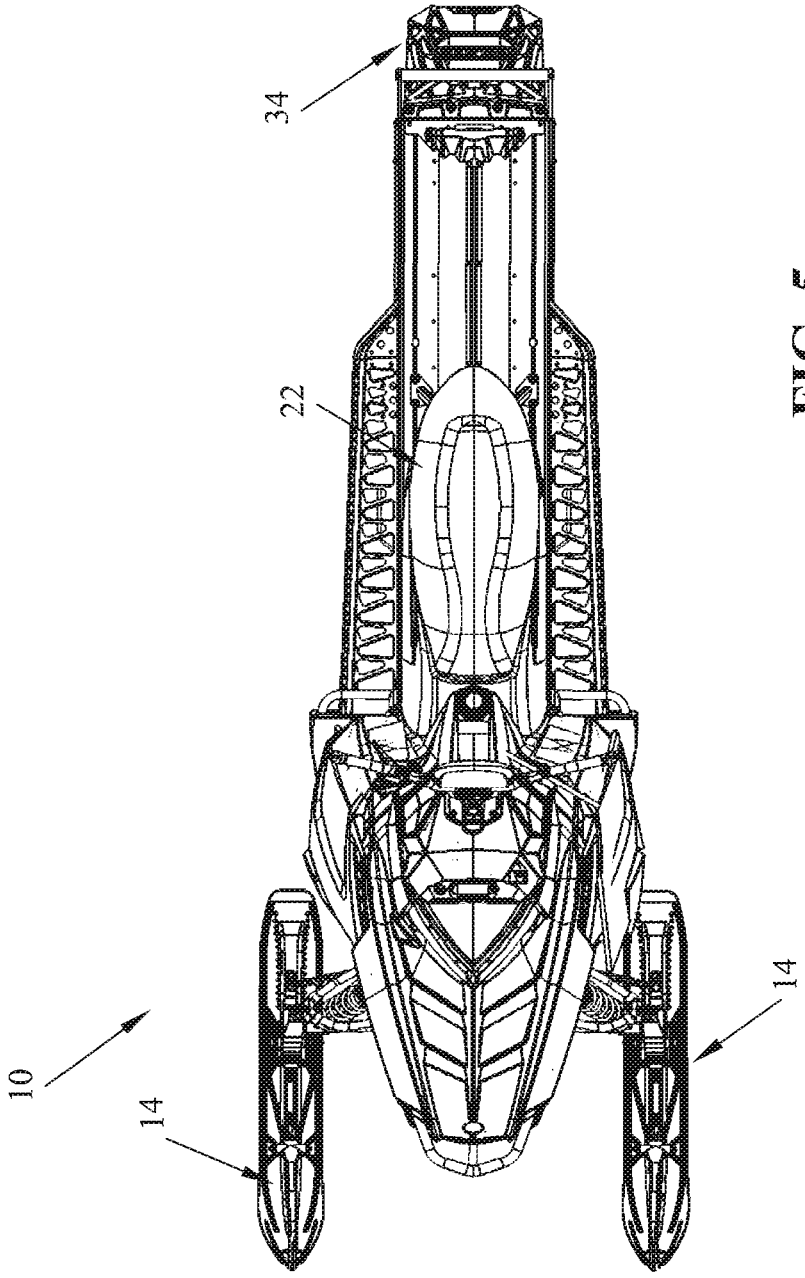

FIG. 5

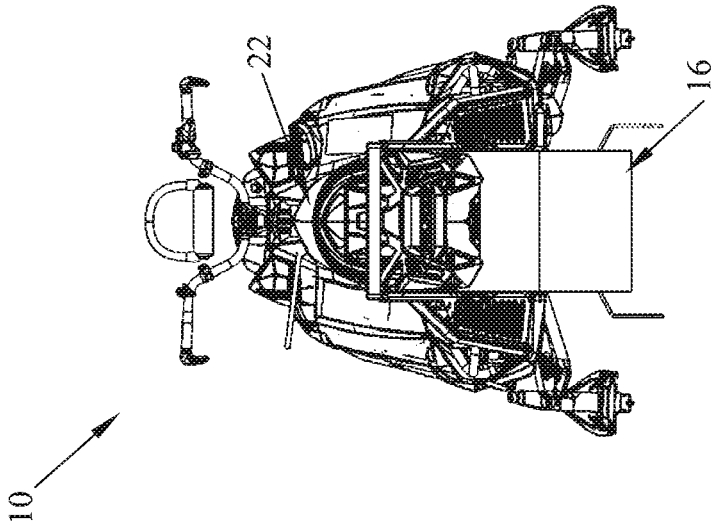

FIG. 7

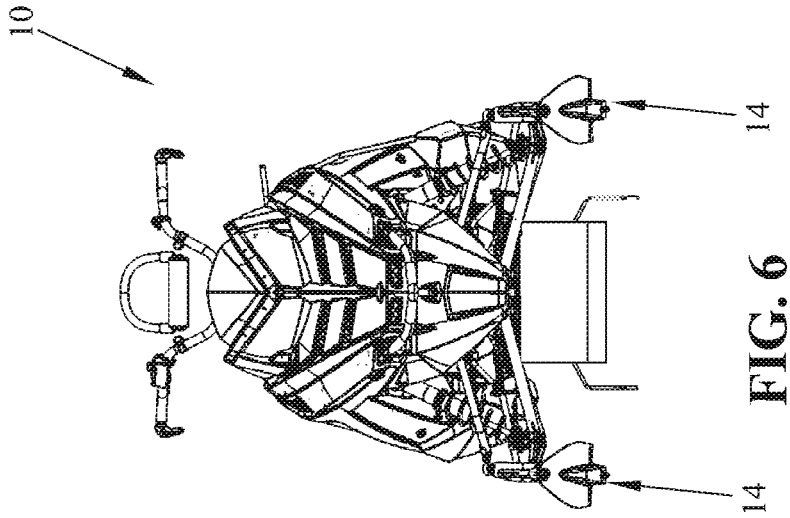

FIG. 6

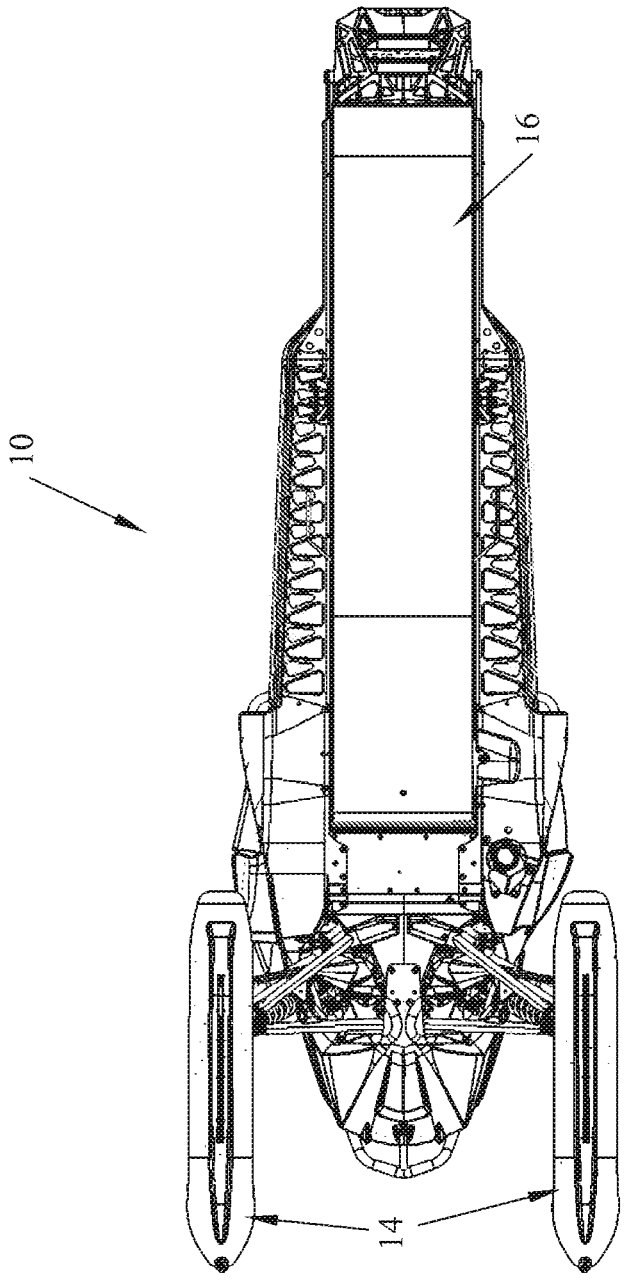

FIG. 8

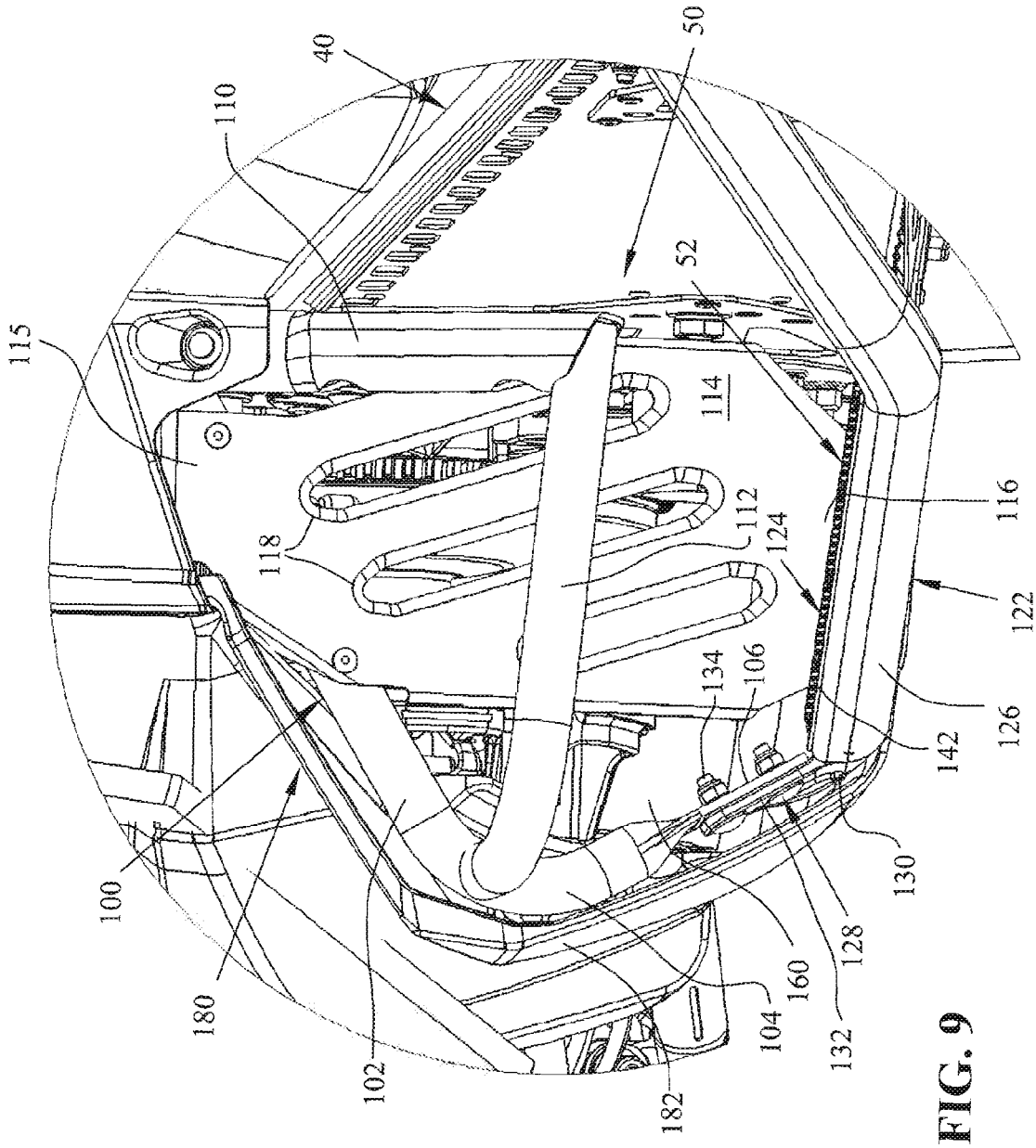
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FIG. 9

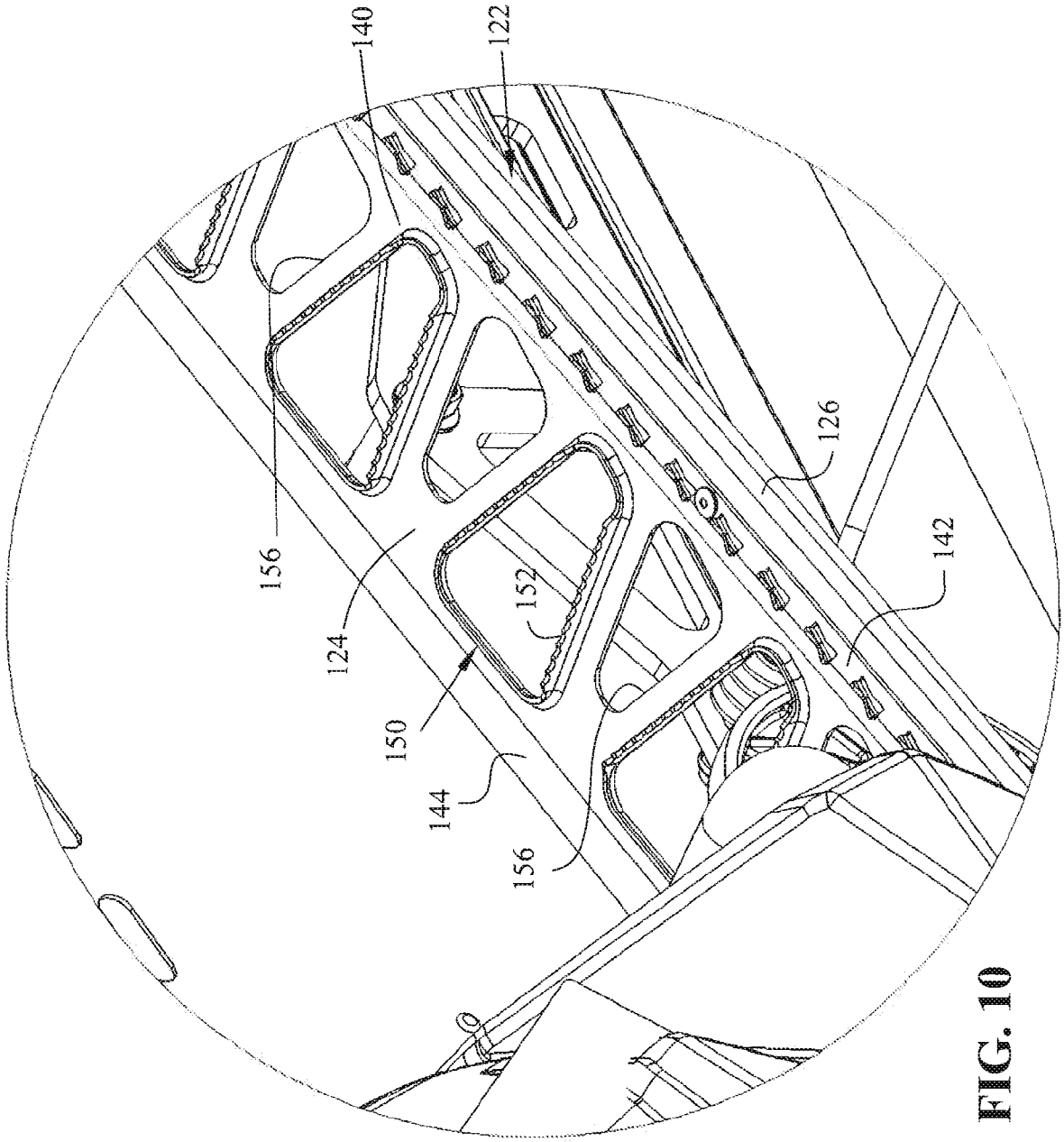

FIG. 10

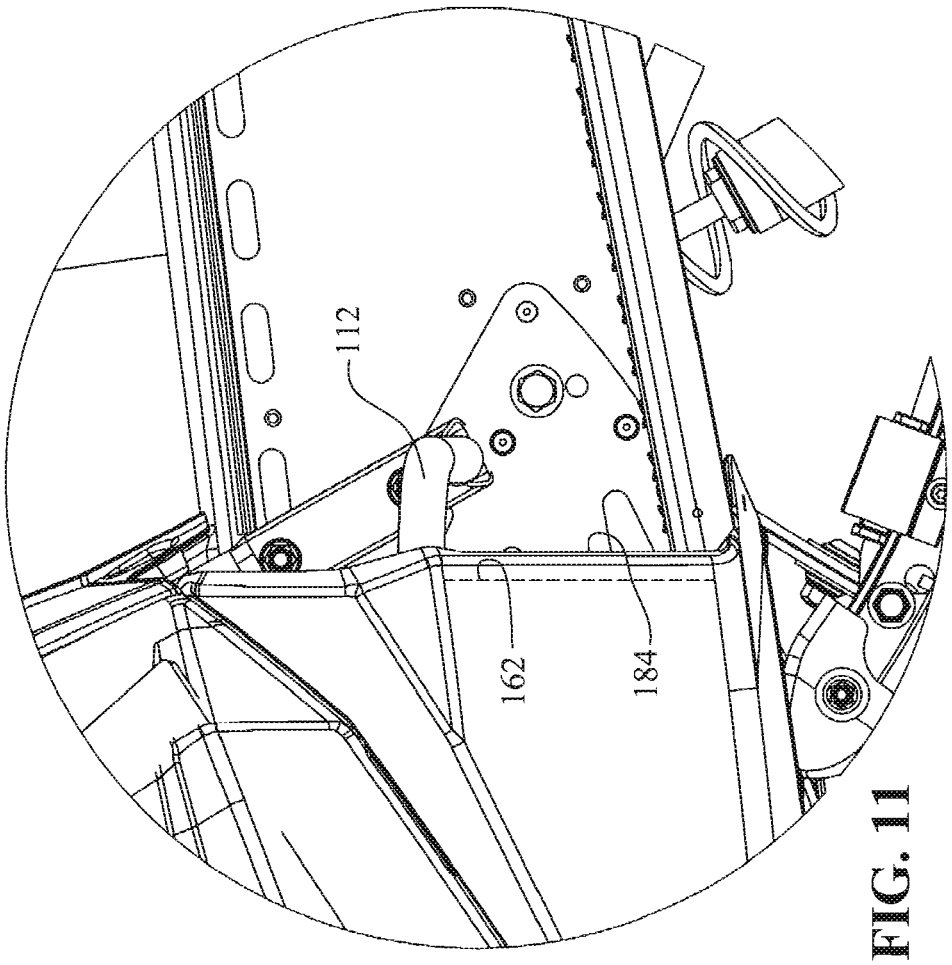

FIG. 11

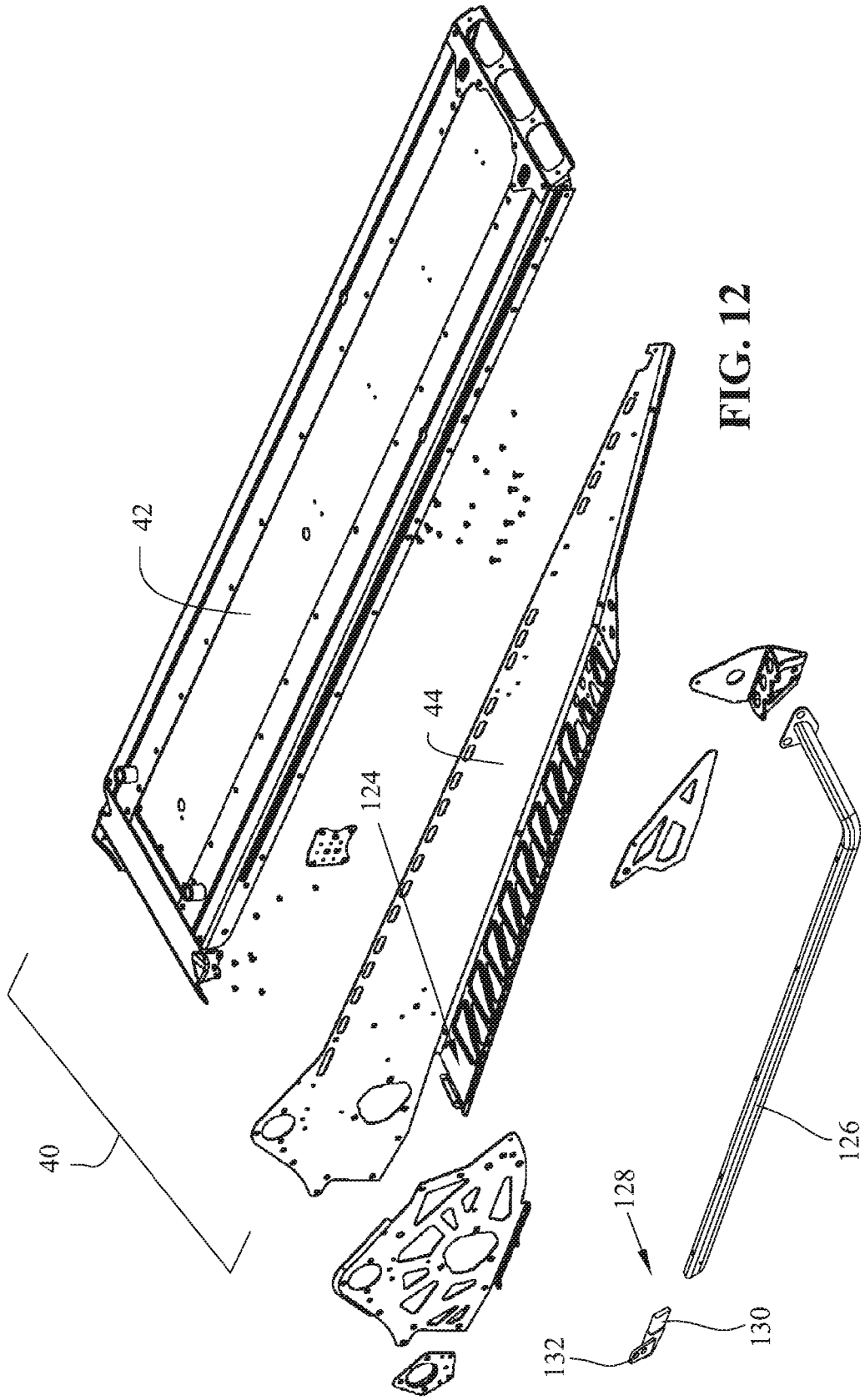

FIG. 12

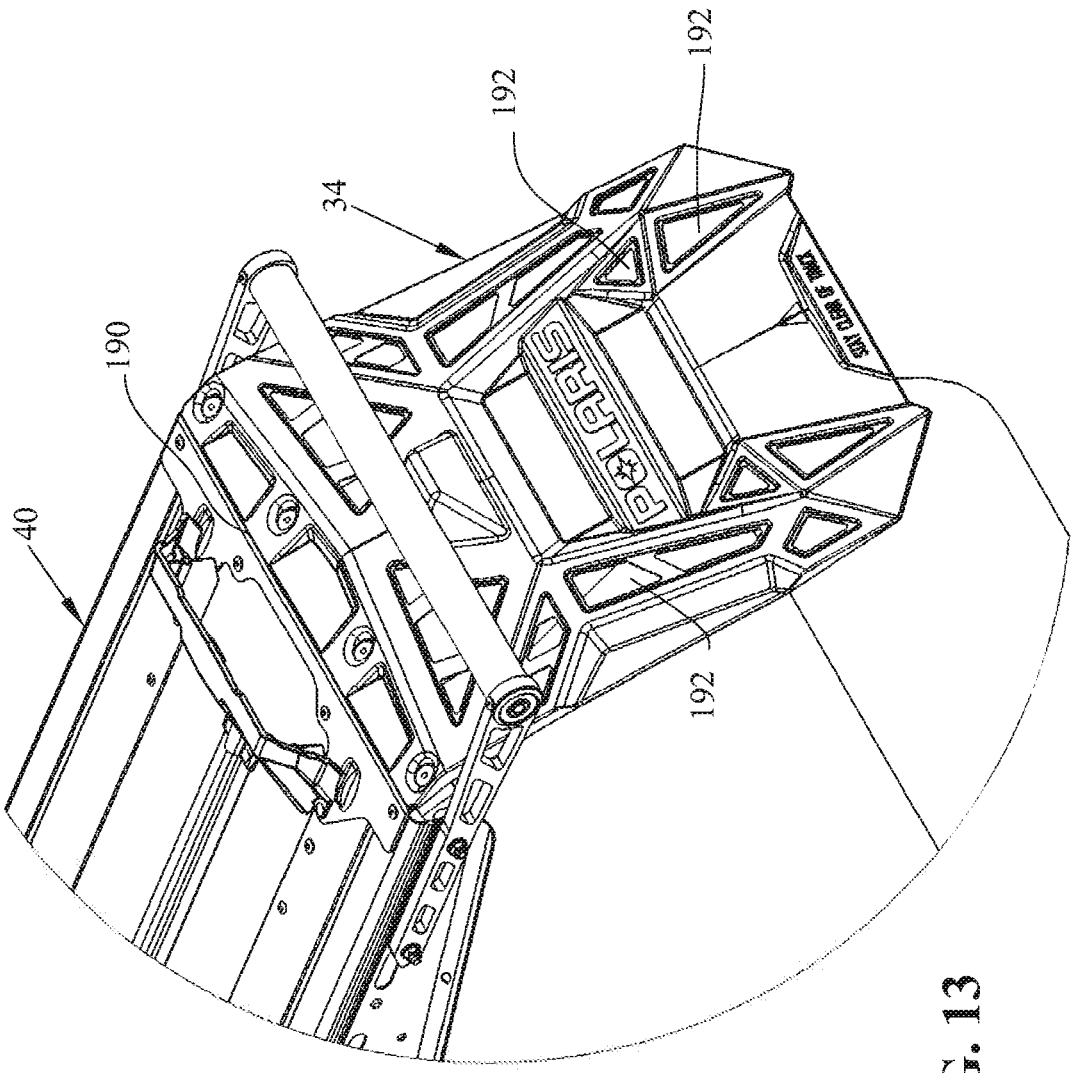

FIG. 13

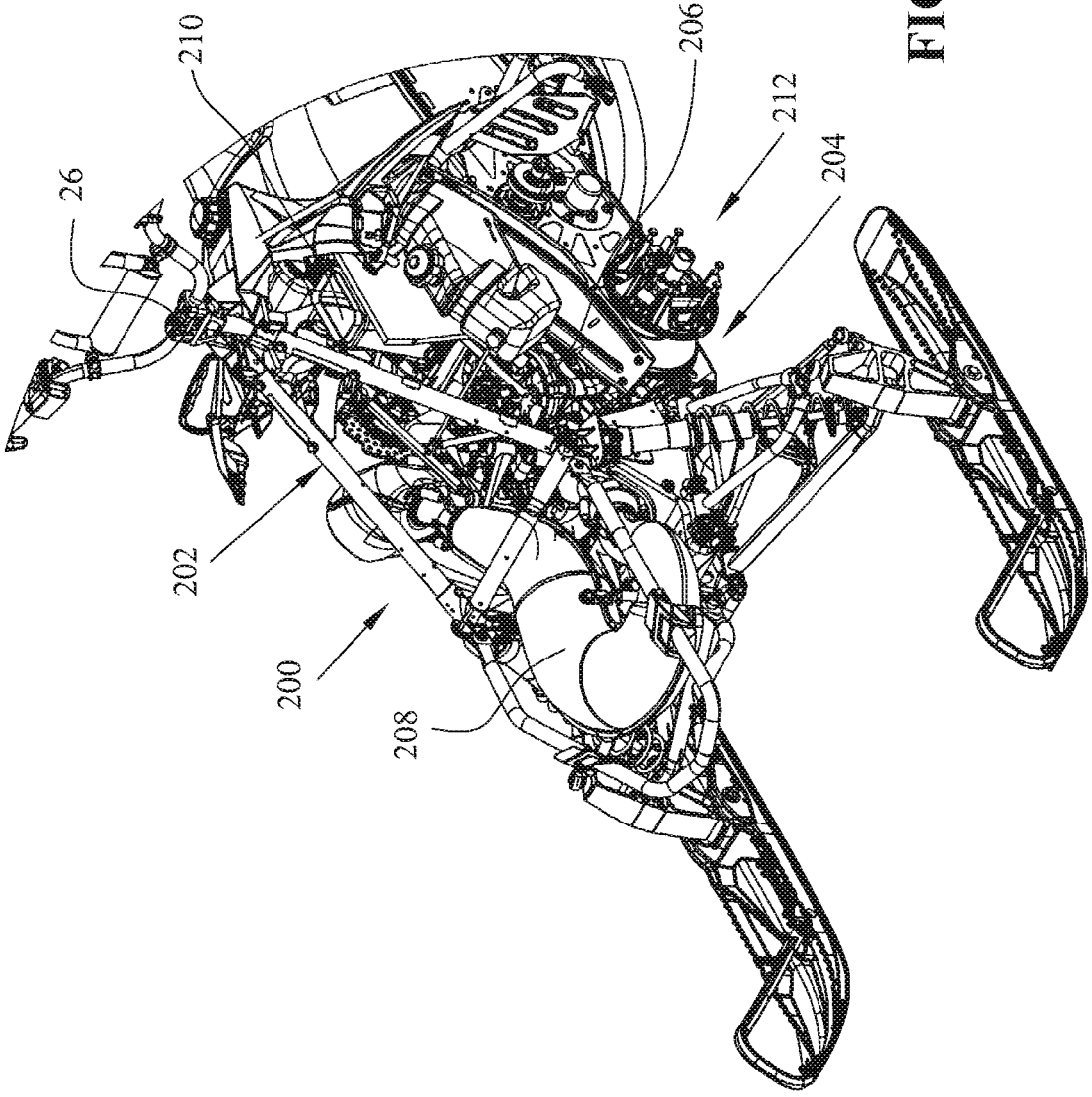

FIG. 14

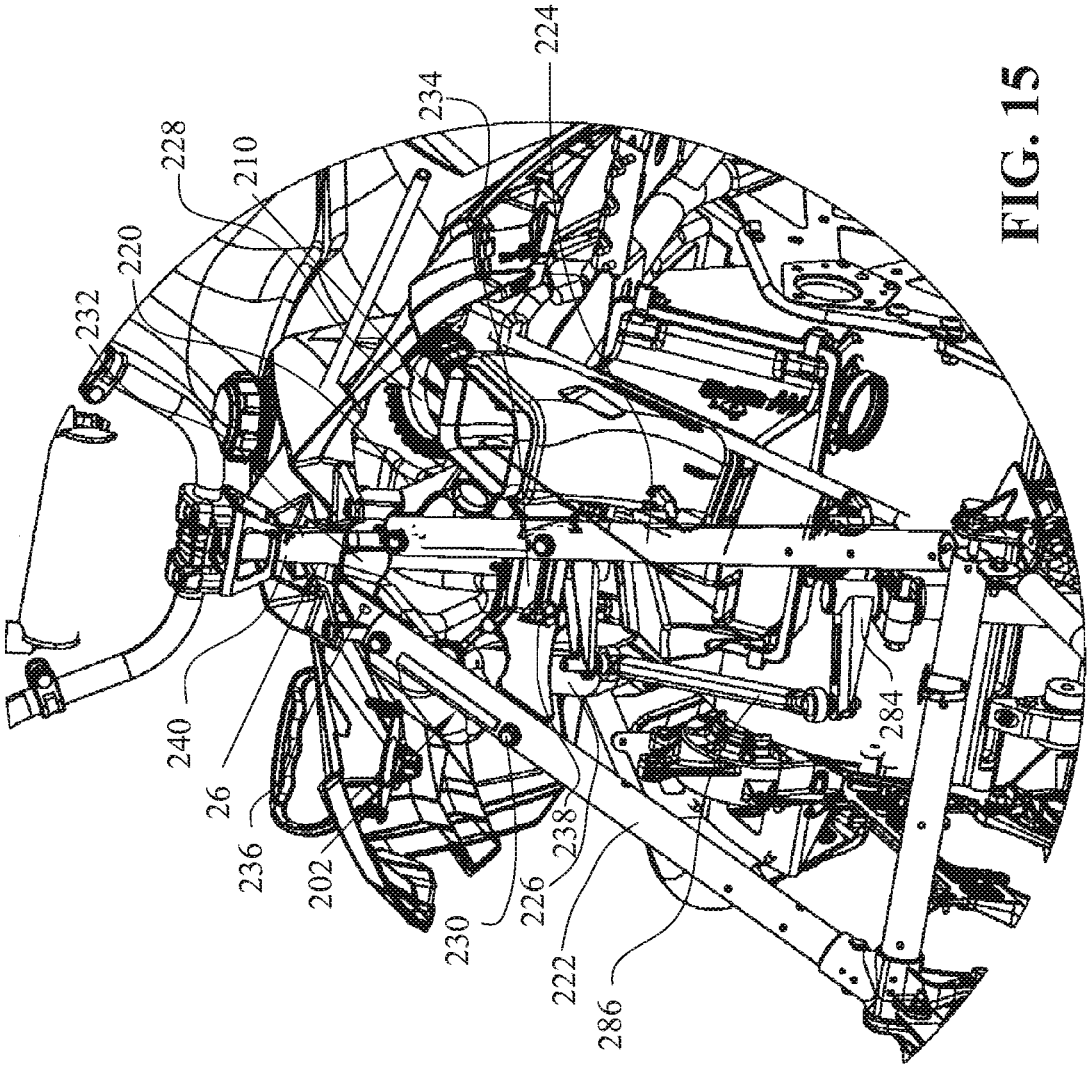

FIG. 15

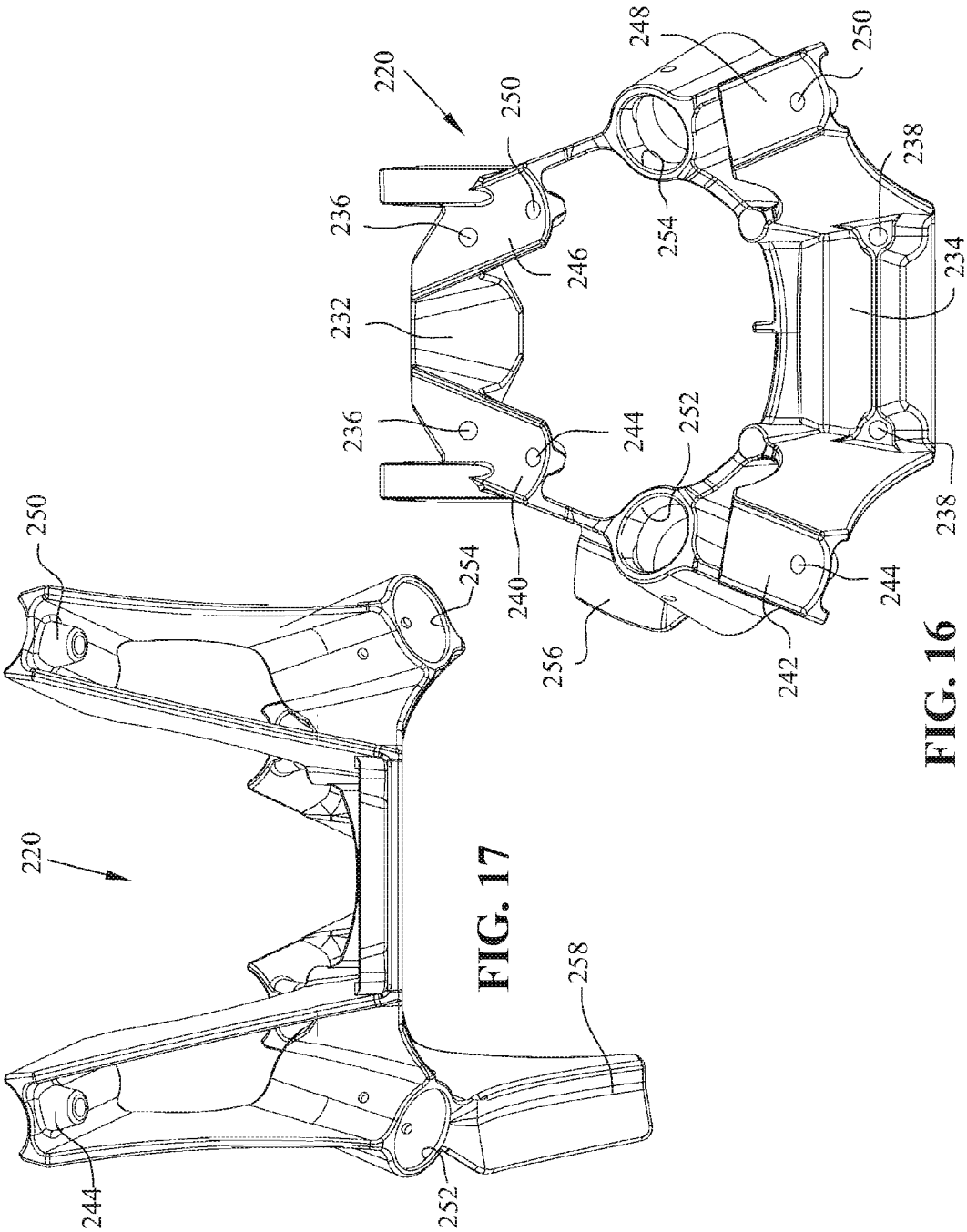
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FIG. 16

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FIG. 17

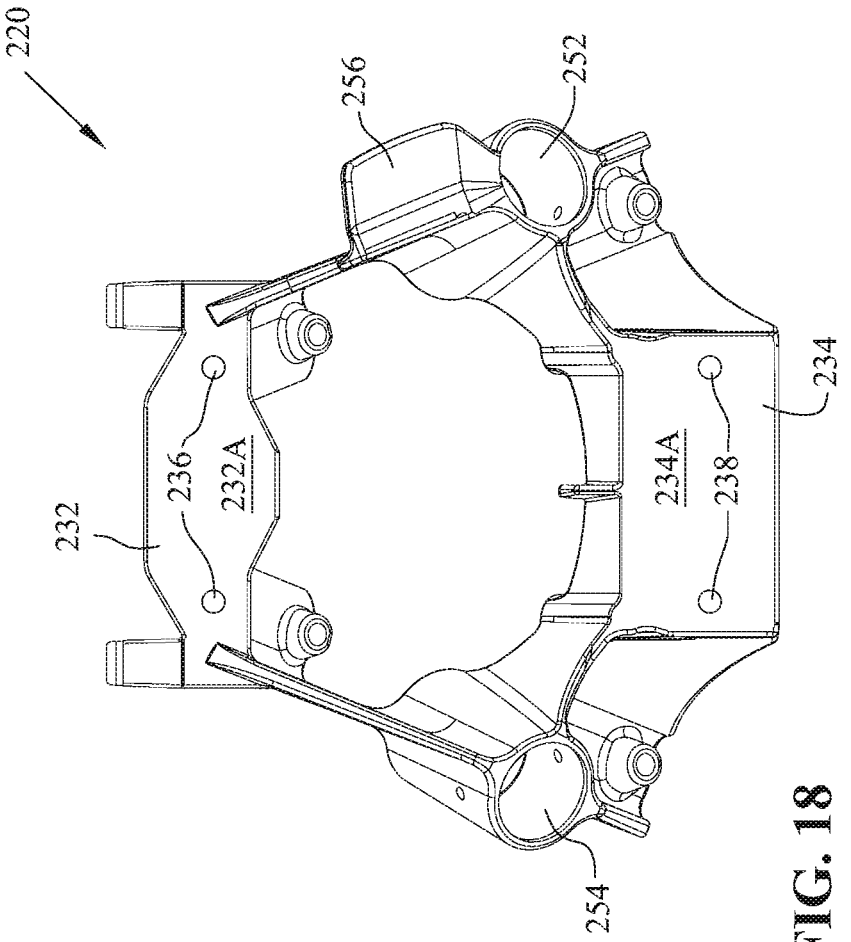
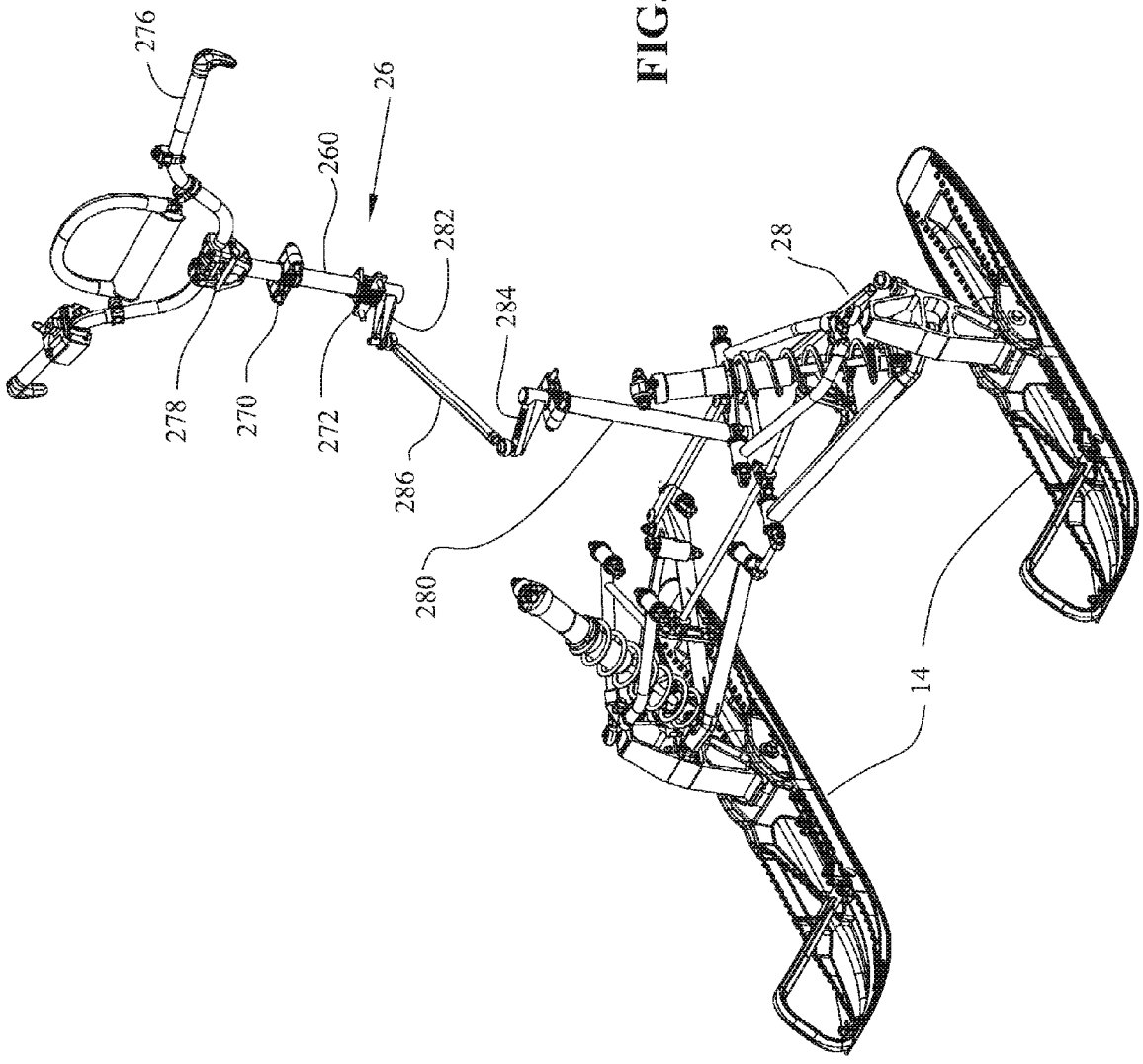


FIG. 18

FIG. 19



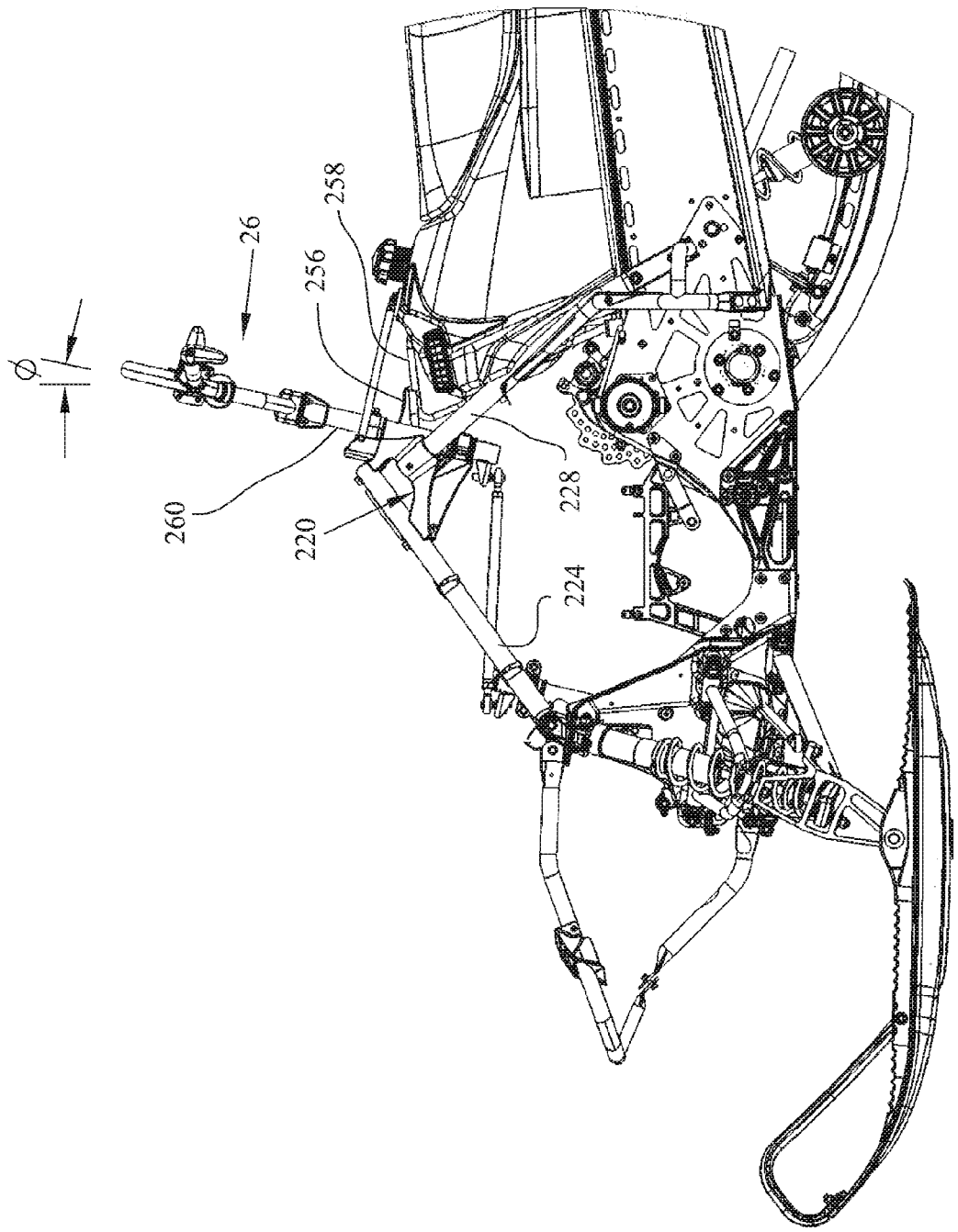


FIG. 20

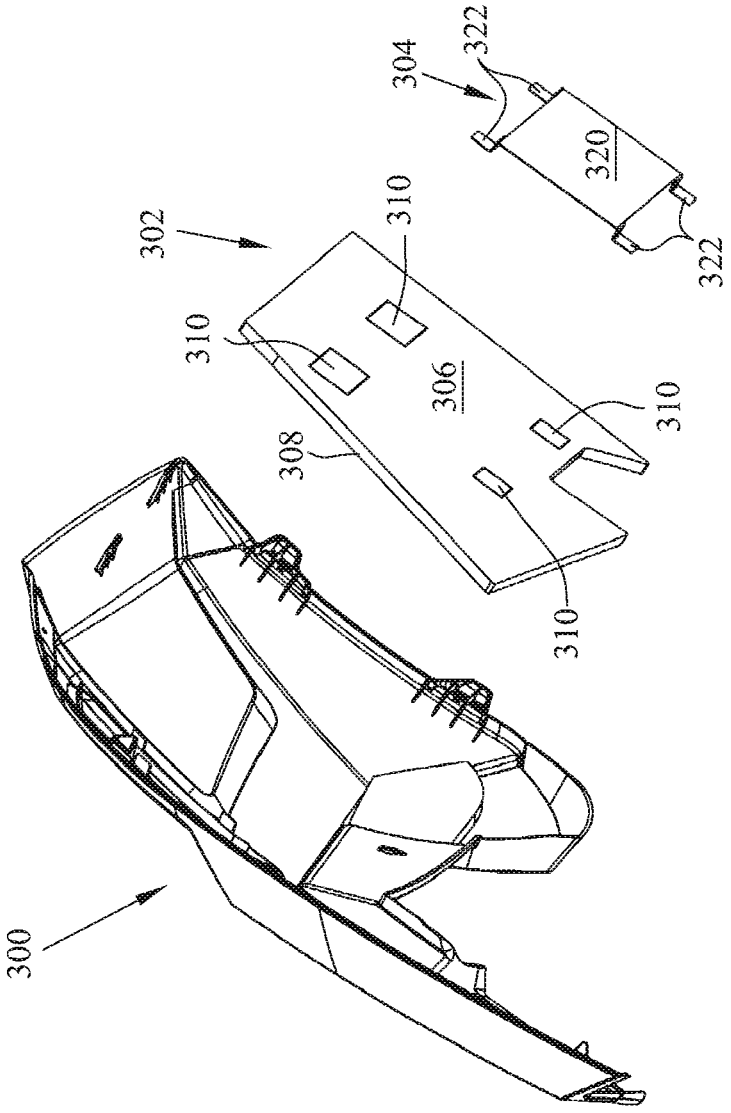


FIG. 21

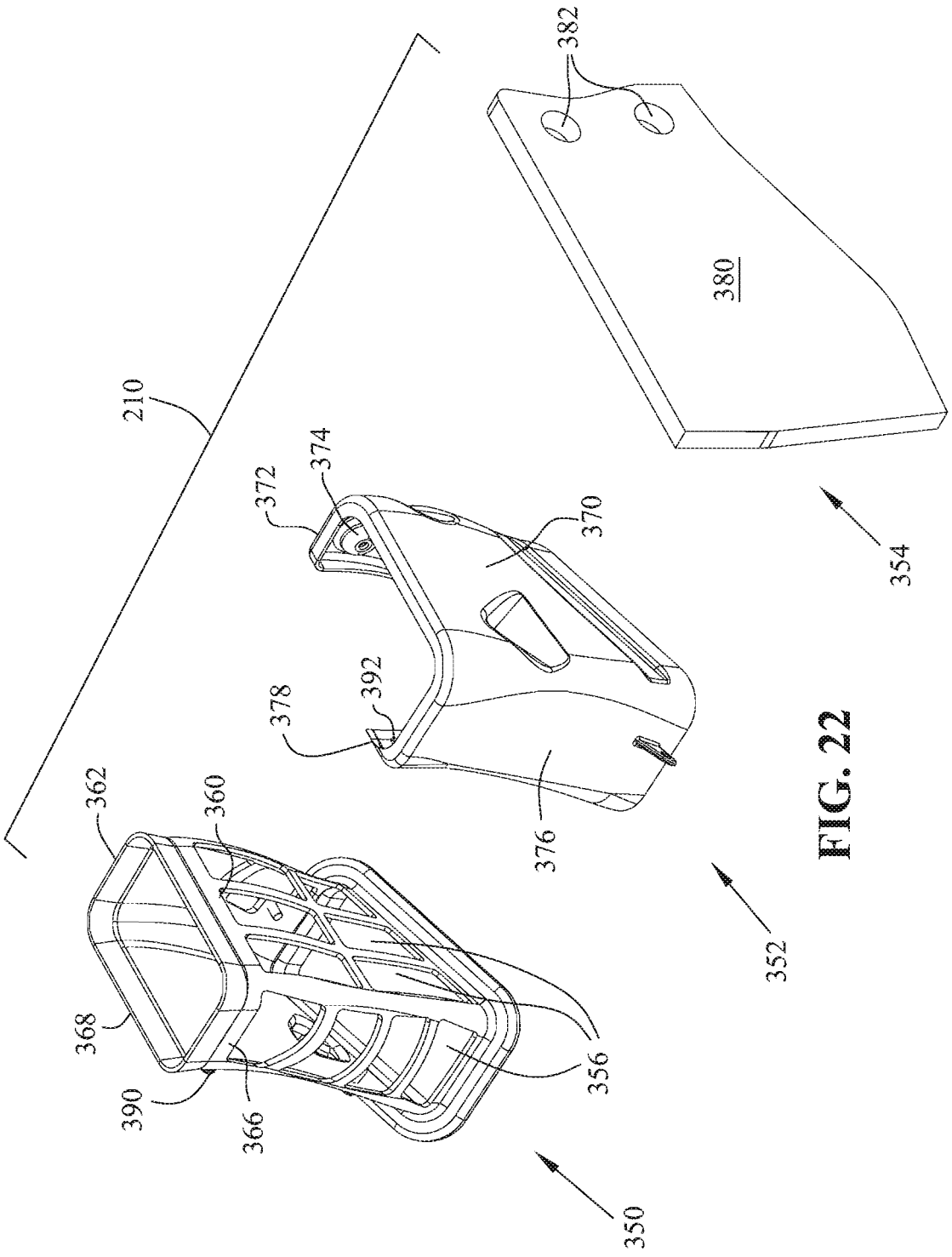

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FIG. 22

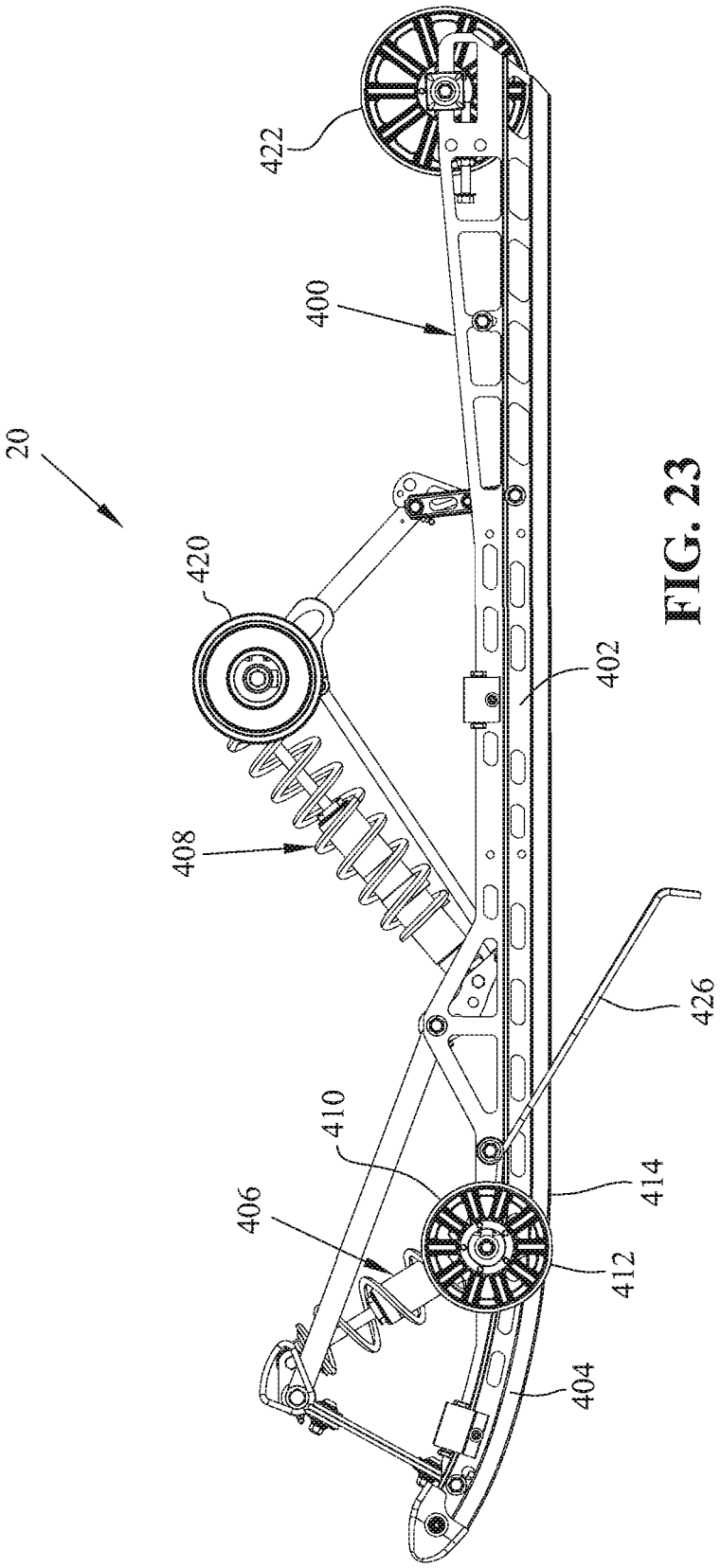

FIG. 23

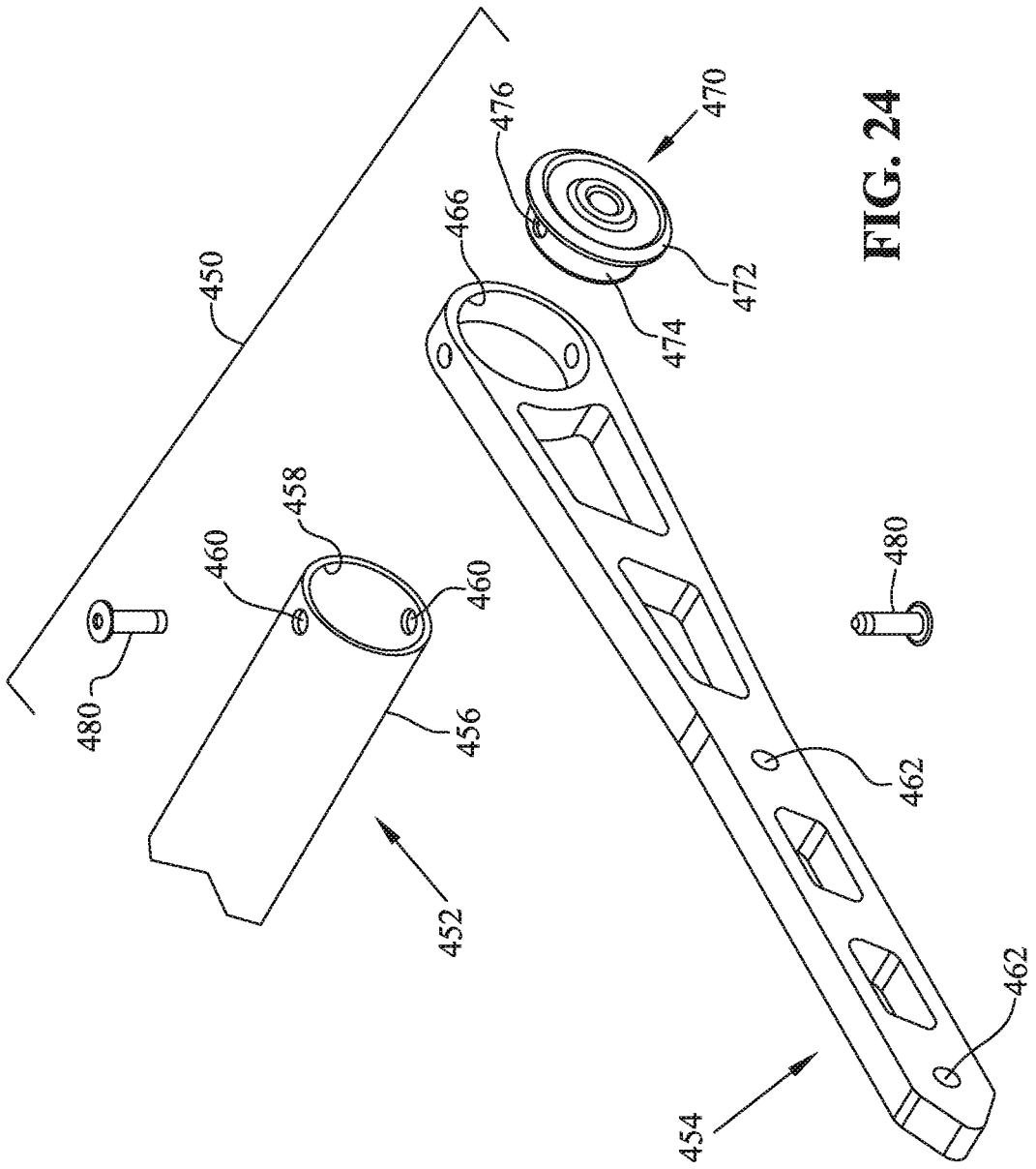

FIG. 24

SNOWMOBILE

This application claims the benefit of U.S. Provisional Patent Application Ser. No. 61/302,394, filed on Feb. 8, 2010, and U.S. Provisional Patent Application Ser. No. 61/337,676, filed on Feb. 9, 2010, the complete disclosures of which are expressly incorporated by reference herein.

BACKGROUND

The present invention generally relates to snowmobiles. More particularly, the present invention relates to the components of a snowmobile such as the frame, suspension, running boards and various other assemblies.

Generally, there are a variety of configurations of snowmobiles available for applications such as deep snow, high performance, luxury touring, trail riding, etc. Most snowmobiles include a frame, a power train, a pair of front skis, and an endless belt assembly. Typically, features such as engine displacement and track length vary depending upon the specific application for which the snowmobile is targeted. For example, snowmobiles designed primarily for deep snow application may include an endless belt assembly having a longer track length, i.e. 166 inches (4.2 meters), than a snowmobile designed primarily for trail riding, i.e. 135 inches (3.4 meters). A snowmobile designed for deep snow may also include a relatively large displacement engine, i.e. 900 cc^3 (54.9 $inches^3$), to provide suitable power when operating in a mountain environment at higher elevations with less oxygen. Other features of a deep snow snowmobile may be added to improve ride and handling characteristics such as side hilling.

A deep snow snowmobile is shown in our patent application Ser. No. 11/501,454 filed Aug. 9, 2006, the contents of which are incorporated herein by reference.

SUMMARY

One illustrative embodiment of the present invention includes a snowmobile comprising a frame, a power train supported by the frame; a running board assembly supported by the frame and comprising a toe clip, a front wall and a foot tread; and a shroud laterally encompassing the toe clip and the back wall, with the toe clip extending rearwardly, beyond a rear edge of the shroud.

Another illustrative embodiment of the present invention includes a frame; a power train supported by the frame; a running board assembly supported by the frame and comprising a toe clip, a front wall and a foot tread; and a shroud laterally encompassing the toe clip and the back wall, with the back wall extending substantially aligned with a rear edge of the shroud.

Another illustrative embodiment of the present invention includes a snowmobile comprising: a frame; a power train supported by the frame; and a running board assembly supported by the frame and comprising a toe clip, a front wall and a foot tread; the foot tread having upturned embossed openings having gripping surfaces thereon.

Another illustrative embodiment of the present invention includes a snowmobile comprising a frame; a power train supported by the frame; and a running board assembly supported by the frame and comprising a toe clip, a front wall and a foot tread; the foot tread having upturned embossed openings and openings through the running board.

Another illustrative embodiment of the present invention includes a snowmobile comprising a frame; a power train supported by the frame; a running board assembly supported by the frame and comprising a toe clip, a front wall and a foot tread; and a shroud laterally encompassing the toe clip and the back wall, with the back wall extending substantially aligned with a rear edge of the shroud.

The above mentioned and other features of this invention, and the manner of attaining them, will become more apparent and the invention itself will be better understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front perspective view of an illustrative embodiment of a snowmobile;

FIG. **2** is a rear perspective view of the embodiment shown in FIG. **1**;

FIG. **3** is a side view of the left hand side of the embodiment shown in FIG. **1**;

FIG. **4** is a side view of the right side of the embodiment shown in FIG. **1**;

FIG. **5** is a top view of the embodiment shown in FIG. **1**;

FIG. **6** is a front view of the embodiment shown in FIG. **1**;

FIG. **7** is a rear view of the embodiment shown in FIG. **1**;

FIG. **8** is a bottom view of the embodiment shown in FIG. **1**;

FIG. **9** is an enlarged view of the running board assembly of the embodiment shown in FIG. **1**;

FIG. **10** is an enlarged view of the foot tread of the embodiment shown in FIG. **1**;

FIG. **11** is an enlarged side view of a front portion of the running board;

FIG. **12** is an exploded view of the tunnel;

FIG. **13** is an enlarged view of the rear snow flap;

FIG. **14** is a partial front perspective view of the snowmobile with the front body removed;

FIG. **15** is an enlarged front perspective of the front frame;

FIG. **16** is a front perspective of the cast frame member;

FIG. **17** is an underside perspective view of the cast frame member of FIG. **16**;

FIG. **18** is a rear view of the cast frame member;

FIG. **19** is a front perspective view of the steering assembly;

FIG. **20** is a side view of the steering assembly mounted to the cast frame member of FIG. **16**;

FIG. **21** is a side perspective view of a heat shield member mounted to an inside of the body panel; and

FIG. **22** is an exploded perspective view of the air intake system;

FIG. **23** is a side showing the suspension system removed from the tunnel; and

FIG. **24** shows an exploded view of a rear bumper.

DETAILED DESCRIPTION

Corresponding reference characters indicate corresponding parts throughout the several views. Although the drawings represent embodiments of the present invention, the drawings are not necessarily to scale and certain features may be exaggerated in order to better illustrate and explain the present invention.

The embodiments disclosed below are not intended to be exhaustive or to limit the invention to the precise forms disclosed in the following detailed description. Rather, the embodiments are chosen and described so that others skilled in the art may utilize their teachings. For example, while the

following description refers primarily to a snowmobile, it should be understood that the principles of the invention apply equally to other snow vehicles. While the present invention primarily involves a snowmobile, it should be understood, however, that the invention may have application to other types of vehicles, such as motorcycles, ATVs, utility vehicles, scooters, and mopeds.

Referring to FIGS. **1-8**, one illustrative embodiment of a snowmobile **10** is shown. Snowmobile **10** includes a frame **12**, supported by front skis **14** and by endless belt assembly **16**. Front skis are coupled to a front suspension **18**, and endless belt assembly is supported by a rear suspension **20**. Snowmobile also includes a seat assembly **22**, front outer body **24**, and a steering assembly **26**. Steering assembly **26** is operably coupled to steering arms **28** (FIG. **2**) which allows a rider to steer snowmobile **10**. A power train is covered by outer body **24** and provides power to endless belt assembly **16**. Running board assemblies **32** extend along the sides of the seat assembly which are supported by the frame **12**. A snow flap **34** (FIG. **2**) is also supported by the frame rearward of the endless belt.

With reference to FIGS. **1** and **2**, frame **12** includes a tunnel **40** having a top wall **42** and side walls **44**. As shown best in FIG. **2**, endless belt **16** at least partially runs up into tunnel **40** between side walls **44** and upwardly towards top wall **42**. As shown, running board assemblies **32** include a rider's foot grip assembly **50** (FIG. **4**) and a foot tread assembly **52**, where the foot grip assembly **50** and foot tread assembly **52** are supported by the tunnel sidewall **44**. As shown best in FIGS. **11** and **12**, the tunnel **40** also include a plurality of cutout portions **46** which reduce the material in locations where fasteners are not needed. These cutouts **46** help to reduce the weight of the entire vehicle. The surface to which sidewalls **44** abut (not shown), also include notches but complement notches **46** such that the notches do not overlap. Other cutouts could be provided elsewhere as well.

With reference now to FIG. **9**, the foot grip assembly **50** is shown in greater detail. Foot grip assembly **50** includes frame member **100** which extends over the top wall **42** of tunnel **40**, having a first portion **102** extending downwardly and away from the tunnel, and a second portion **104** extending downwardly and reversely bent towards the tunnel. The end of portion **104** is flattened and includes a flange at **106**. Foot grip assembly **50** further includes a tube portion **110** which is fastened to the side of the tunnel and connected to frame portion **100** for example, by welding. A toe clip **112** extends between frame member **110** and frame portion **102**. Finally, foot grip assembly **50** includes a back wall **114** attached at marginal edges **115** and **116**, and comprises plural slotted openings **118**.

With reference to FIGS. **9-12**, foot tread assembly **52** is comprised of an elongate frame member **122** and running board plate **124**. Elongate frame member **122** is comprised of a tube **126** and a frame bracket **128**. As shown in FIG. **12**, frame bracket **128** is discreet from tube **126**. Bracket **128** includes a bracket foot **130** which extends into tube **126** and a bracket arm **132** for attachment to flange **106**. Bracket foot **130** may be attached to tube **126** by way of fasteners, welding or adhesives, or a combination thereof. As shown (FIG. **9**), the flattened surfaces of flanges **106** and bracket arms **132** are positioned back to back and attached by way of fasteners **134** (FIG. **9**). Furthermore, the planes of the flat surfaces of flanges **106** and bracket member **132** extend in a longitudinal direction as described herein.

With respect now to FIGS. **9** and **10**, running board plate **124** is comprised of a plate portion **140** having a lip **142** positioned and attached to elongate tube member **126** as shown. The opposite side of the plate portion **140** has a marginal edge **144** which is attached to the tunnel side wall **44**. As shown in FIG. **12**, the running board plate **124** is integral with the tunnel side wall **44**, however this connection could also be by fastening, such as by welding, adhesives or riveting.

The running board plate **124** further includes a plurality of upturned embossments **150** (FIG. **10**) having a generally triangular shape with gripping serrations **152** positioned thereon. Intermediate each of the upturned embossments **150** is an opening **156**, of reverse triangular shape, where the embossments **150** rigidify the plate portion **140** whereas openings **156** maximize the open area of the foot tread to allow snow to drop downwardly therethrough. This provides a smooth bottom surface to plate portion **140**, having no interference with the snow.

Thus, as shown in FIG. **9**, an enlarged ventilation area is defined by the spacing at **160** and within the slots **118**. The longitudinal disposition of the flanges **106** and **132** as described above also maximizes the ventilation area **160**, particularly for the removal heat from the engine compartment as described herein.

Finally, with respect to FIGS. **9-11**, an outer shroud **180** covers foot grip assembly **50** and includes a shroud portion **182** which encompasses portions **102** and **104** of frame tube **100**. Shroud **180** also includes a rear edge **184** (FIG. **11**) which is proximate to back wall **162**. As shown best in FIG. **11**, toe clip **112** extends rearwardly beyond rear edge **184** of shroud **180** which provides easy access for the rider to place their boot in the toe clip, yet prevents forming a pocket into which snow may accumulate and pack. Also, the forward angle of edge **184** allows a rider's foot to position sideways, overlapping the foot tread assembly **52**, and yet stay retained behind foot grip assembly **50**.

With reference now to FIG. **13**, snow flap **34** is shown in an enlarged view. Snow flap **34** is hingedly mounted to the tunnel **40** along a rear edge **190**. The snow flap **34** includes a plurality of apertures **192** which reduces the overall weight of the component. These could be machined or molded in.

With reference now to FIG. **14**, the outer body **24** has been removed which better exposes the engine compartment **200**, the steering assembly **26**, the frame front portion **202**, and the power train **204**. The power train **204** includes an engine **206** having an exhaust system **208**, an intake system **210** and a drive system including a CVT **212**. As mentioned above, the ventilation area **160** was defined around the foot grip area, and this allows the CVT ventilation to exhaust through ventilation area **160**.

With reference now to FIG. **15**, the front portion **202** of the frame is shown in greater detail. Front portion **202** includes a cast coupling or connector **220** configured to attach plural frame tubes, namely front frame tubes **222**, **224** and rear frame tubes **226** and **228** thereto. The frame tubes **222**, **224**, **226**, **228** may be attached to the cast coupling **220** by way of fasteners such as **230** and/or may be adhesively fixed to the cast coupling **220**. As shown, the cast coupling **220** further includes two support webs **232** and **234**. Each of the webs is provided with threaded apertures, for example, **236** and **238**. As also shown in FIG. **15**, a steering post **260** of steering assembly **26** is directly coupled to webs **232** and **234** of the cast coupling **220**, as described herein.

With reference now to FIGS. **16-18**, cast coupling **220** will be described in greater detail. Cast coupling **220** further includes a first circular channel (FIG. **16**) defined by portions **240** and **242** having threaded bosses **244** extending downwardly therethrough. A second circular channel is defined by portions **246** and **248** having threaded bosses **250**

therein. The circular channels are intersected by cylindrical members **252** and **254**. Thus, with a comparison of FIGS. **15** and **16**, it should be appreciated that frame tubes **222** and **224** are positioned across the circular channels with fasteners such as **230** positioned through the frame tubes **222**, **224** and into the threaded bosses **244**, **250**. Adhesive may also be applied. Meanwhile, frame tubes **226** and **228** are positioned in the cylindrical members **252** and **254**, and may also be fixed in place by way of fasteners and adhesive.

With reference now to FIG. **18**, cast coupling **220** includes machined mounting surfaces **232**A and **234**A on the backside of the webs **232** and **234**, respectively, for mounting the steering post as described below. Finally as best shown in FIG. **17**, cast coupling **220** includes an integral fuel tank mounting tab shown at **258**.

With reference now to FIG. **19**, the steering assembly is shown in greater detail. As shown, steering post **260** includes an upper and lower bearing posts **270** and **272** which attach to the backside of the webs **232**, **234** respectively, with fasteners being attached to threaded apertures **236** and **238**, respectively. This rigidly connects the steering post **260** to the cast coupling **220** yet allows the steering post to pivot about the corresponding bushings **270** and **272**. As also shown, handlebars **276** of steering assembly **26** are attached to the steering post **260** by way of a clamp at **278**.

Steering assembly **26** further comprises a lower steering post **280** which is operatively coupled to steering post **260** by way of respective link arms **282**, **284**, connected together by way of a link **286**. Lower steering post **280** is ultimately connected to steering arms **28** by way of a further steering arm, not shown, to maneuver the steering skis **14**.

With reference now to FIG. **20**, steering assembly **26** is shown mounted to the backside of cast coupling **220** with the bushings **270**, **272** (FIG. **19**) mounted to the surfaces **232**A, **234**A (FIG. **18**), respectively. As shown, steering post **260** is nearly vertical and could be in the range where angle θ could be between 0 and 15 degrees and as shown is about 13 degrees. As steering post **260** is positioned at a substantially upright angle, the ergonomics is improved for the deep snow rider.

As known, when side hilling, a rider is often standing on only one side of the running board assemblies **32** and the maneuverability of the steering post and handlebars **276** is substantially increased when the steering post **260** is close to vertical. This prevents the handlebars **276** from dipping down or raising up on either side when attempting to steer the snowmobile while standing on only one side.

FIG. **20** also shows a fuel tank **258** having a front end positioned adjacent to the integral fuel tank mounting tab **256** to retain a front end of the fuel tank **258**. Fuel tank **258** may be attached to tab **256** through fasteners, or fuel tank could have a molded slot to be applied over tab **256**.

With respect now to FIG. **21**, front side panel **300** (see also FIG. **4**) on the right hand side of the snowmobile is provided with sound insulation **302** as well as a heat shield **304**. The foam includes a front surface **306**, a back surface **308**, and a plurality of cutouts **310** extending between the front and back surface. Heat shield **304** includes a plate **320** having a plurality of mounting feet **322** which correspond in location to the apertures **310**. An adhesive is provided against the back surface **308** to retain sound insulation to the inside surface of the panel **300**. Heat shield **304** can be placed with the feet **322** aligned with the associated apertures **310** and pressed against the foam **302** until the feet contact the adhesive, through the apertures, which retains the heat shield to the foam member **302**. This prevents any fasteners or additional dimensional requirements for attaching the heat shield to the foam. This also provides less weight for the snowmobile yet provides a heat shield **304** adjacent to a portion of the exhaust system of the snowmobile power train as described above. The adhesive could be a double-sided sticky tape, double sided foam tape, or any other adhesive for the purposed described.

Referring now to FIG. **22**, air inlet **210** (FIG. **15**) is shown in greater detail as comprised of inlet housing **350**, retainer housing **352** and sound-deadening foam **354**. Housing **350** is generally rectangular having a plurality of apertures **356** extending therethrough, where the rectangular housing has a front wall **360**, sidewall **362** opposite side wall **366** and rear wall **368**. Retainer **352** includes a front wall **370**, sidewall **372** having lugs **374**, opposite sidewall **376** and a partial rear wall **378**. Sound-deadening foam **354** generally includes a foam body portion **380** having locating apertures at **382**.

It should be appreciated that the foam **354** is positioned on an inside of the retainer member **352** with lugs **374** aligned with apertures **382** of the foam **354**. The retainer and foam together are then snapped around housing **350** with the front wall **370** of retainer **352** positioned against front wall **360** of housing **350**, sidewalls **372** and **376** positioned adjacent to corresponding sidewalls **362** and **366**, respectively, and with partial wall **378** at retainer **352** positioned against back wall **368**. The retainer **352** and housing **350** can be held together by way of corresponding latch members such as lug **390** and aperture **392** to retain the two components together. This provides an easy to assemble two component intake system **210** having an internal housing **350** and a retainer housing **352** whereby air traveling through the intake system can be sound-deadened by foam member **354**.

With reference now to FIG. **23**, rear suspension **20** is shown removed from the tunnel, understanding that the rear suspension is attached to the underside of tunnel **40**. Suspension **20** includes a frame **400** having laterally spaced frame rails **402** with slide rails **404** attached thereto. Suspension **20** includes two coil over shocks **406** and **408** providing dampening between the tunnel **40** and frame **400**. A track roller **410** is mounted on the outside of the slide rail **402**, and as shown, has an outer radial surface **412** which extends beyond lower surface **414** of slider **404**. Track rollers **410** are located at a position proximate a maximum pressure point between the sliders **404** and track (absent the track wheel) which allows the track a slight spacing between the sliders **404** preventing substantial frictional heating. Suspension **20** also includes idler rollers **420** and **422**. Scratchers **426** are also provided on the side of frame **404** to break up crusted snow in order that the track can throw snow against the underside of tunnel **40**, as the tunnel includes a heat exchanger for engine water.

With reference now to FIGS. **13** and **24**, a rear bumper assembly **450** is shown including a rear bumper member **452** and side brackets **454**. Bumper member **452** is comprised of a carbon fiber material and as best shown in FIG. **24** has an outer diameter **456**, an inner diameter **458**, and apertures **460**. Side brackets **454** are comprised of an extruded aluminum and include apertures **462** for mounting the side brackets to tunnel **40** by way of fasteners **464** (FIG. **13**). As shown, extruded brackets **454** have extruded openings at **466** and apertures **468** which extend into openings **466**. A cap **470** is also provided having a lip **472**, and a reduced diameter portion **474** having apertures **476**.

To assemble bumper assembly **450**, bumper member **452** is positioned in openings **466** of extruded members **454**. Caps **470** are positioned with diameter portions **474** within inner diameter **458** and with the lips **472** against the extruded side bracket **454**, with apertures **460** and **476** aligned.

Fasteners **480** are then placed through the extruded members **454**, bumper member **452** and cap **470** to retain the bumper member thereto. Fasteners **464** could be set screws, bolts, rivets or any similar fastening device, although as shown, fasteners **480** are rivets. As also shown in FIG. **13**, snow flap **34** includes a stop member **490** integrally molded with the flap which has an upper stop surface **492** which abuts against the bumper member **452**.

It should be generally understood that the description provided herein relates only to the specific embodiment, and that other variations could be envisions. For example, while referring herein to tubes, cylindrical tubes are shown, but it is contemplated that other structural geometries, such rectangular or square tubes could also be used.

While this invention has been described as having an exemplary design, the present invention may be further modified within the spirit and scope of this disclosure. This application is therefore intended to cover any variations, uses, or adaptations of the invention using its general principles. Further, this application is intended to cover such departures from the present disclosure as come within known or customary practice in the art to which this invention pertains.

What is claimed is:

1. A frame for a snowmobile comprising:

a plurality of frame members; and

a coupling to receive the plurality of frame members, the coupling includes a first open channel and a second open channel and at least one cylindrical member for receiving the plurality of frame members, the coupling being operatively coupled to a lower portion of a steering post of a steering assembly, wherein a forward-most end of the at least one cylindrical member of the coupling is positioned forward of a forward-most end of the lower portion of the steering post, and the steering assembly is mounted to the coupling at a substantially upright angle.

2. The frame of claim **1**, wherein the steering assembly includes the steering post operatively coupled to at least one web of the coupling.

3. The frame of claim **2**, wherein the steering assembly is coupled to the coupling at an angle between 0-15 degrees.

4. The frame of claim **1**, wherein the coupling includes a tab for mounting a fuel tank to the coupling.

5. The frame of claim **4**, wherein the tab is integral with the coupling.

6. The frame of claim **1**, wherein each of the frame members is attached to the coupling with at least one of adhesive and fasteners.

7. The frame of claim **1**, wherein at least a portion of one of the first and second open channels is vertically aligned with a portion of the at least one cylindrical member.

8. A connector for a snowmobile comprising:

a coupling member having a frame portion for securing a plurality of frame members thereto and a steering portion for coupling a steering assembly thereto, the frame portion including a first channel, a second channel, a first cylindrical member, and a second cylindrical member for receiving the plurality of frame members, the first channel including an upper portion having a first upper-most surface and a lower portion, and the second channel including an upper portion having a second upper-most surface and a lower portion; and

the steering portion including a first web and a second web for receiving a steering post of a steering assembly, the first web including an upper-most surface directly coupled to the first upper-most surface of the first channel and the second upper-most surface of the second channel such that the upper-most surfaces of the first web, the first channel, and the second channel define a continuous outer surface of the upper portion of the coupling member, and the second web extending between the lower portion of the first channel and the lower portion of the second channel.

9. The connector of claim **8**, wherein a first axis of the first channel is intersected by a first axis of the first cylindrical member and a second axis of the second channel is intersected by a second axis of the second cylindrical member.

10. The connector of claim **8**, wherein the steering post is operatively coupled to a back face of the first web and a back face of the second web between 0-15 degrees.

11. The connector of claim **8**, further comprising a tab for mounting a fuel tank to the connector.

12. The connector of claim **8**, wherein the first web is vertically aligned with rearwards ends of the first and second cylindrical members.

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